CONCLUSIONS

Current research has investigated the structure and mechanical properties of composite B_4C-ZrB_2, produced with spark-plasma sintering and determined that:

1. Introduction of monocrystalline ZrB_2 particles into the ceramic allows obtaining of much higher values of micro hardness and fracture toughness (HV=35-40 GPa, K_{1c}=8-10 MPa·$m^{1/2}$).
2. The great influence on the mechanical properties of ceramic has the mixing mechanism of boron carbide – zirconium diboride mixture. The damp mixing allows to obtain more even distribution of fibers and to avoid clusters, which allowed to obtain better properties.
3. Crack growth in the samples is slowed down mostly by the crack deflection mechanism. Although, by the samples, that were produced with the usage of damp mixing, are also observed the crack branching and grain pulling mechanisms.
4. The samples have much higher values of bending strength, compared to the raw boron carbide (250-300 MPa). The elasticity module is on the contrary reduced, which tells about the increasing of plasticity of ceramics (350-400 GPa).
5. By using the dry mixing, increasing of the contents of ZrB_2 causes the reducing of bending strength (190 MPa). The reason of this are the laminar inclusions, that were formed during the sintering process due to ZrB_2 fiber coalescence. By the application of load, they become the stress concentrators, which causes the appearance of cracks and destruction of the material.